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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/611,500	07/01/2003	Cha Deok Dong	29936/39429	3359

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EXAMINER

LEE, CALVIN

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 03/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/611,500	<b>Applicant(s)</b> DONG, CHA DEOK	
	<b>Examiner</b> Lee Calvin	<b>Art Unit</b> 2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## OFFICE ACTION

### *Specification*

1. The specification is objected to because of the following informality:

Page 18, line 14, after "second insulating film" insert --108--

### *Claim Objections*

2. Claim 1 is objected to because of the following informality:

Claim 1, line 3, replace "tunnel oxide film" with --pad oxide film--

### *Claim Rejections - 35 U.S.C. § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lim et al* (US 6,165,871) in view of *Wu* (US 6,355,540).

a) *Lim et al* discloses a method for forming an isolation layer, comprising the steps of:

- sequentially forming a pad oxide film 42 and a pad nitride film 44 on a semiconductor substrate 10 and then forming an aperture through which an isolation region of the substrate is exposed [Fig. 5]
- forming a trench 46 at the isolation region [Fig. 6 and col. 3]
- forming an insulating film spacer 50 at the sidewall of the pad nitride film in the aperture [Fig. 8]
- forming an ion implantation layer 56 for accelerating oxidization at the bottom of the trench that is exposed through the aperture, with the implantation dose of arsenic about  $1\text{E}11$  to  $1\text{E}16$  atoms/cm<sup>2</sup> at an implantation energy of about 30 to 80keV [Fig. 9 and col. 3, ln.55]
- burying the aperture with an oxide layer by CVD to form an isolation 60 [Fig. 10]
- and removing the pad nitride film and the pad oxide film [Fig. 11]

b) *Lim et al* discloses neither the isolation formed by burying the aperture on a first insulating film with a second insulating film, nor an oxidation process to form the first insulating film with a HDP to form the second insulating film. Nevertheless, such multi-layer isolation is known in the semiconductor processing art as evidenced by *Wu* disclosing V-type trench isolation 10 [Fig. 5]. The isolation formation at least has the step of sequentially forming a first insulating film 14 by oxidation process [col. 4, ln.33] and a second insulating film 16 using a HDP oxide [col. 4, ln.48].

It would have been obvious to one of ordinary skill to have modified the isolation of *Lim et al* by utilizing a multi-layer isolation for the purpose of avoiding a double hump associated with sharp top corner of the isolation [col. 2, ln.27].

It would have been obvious to one of ordinary skill to have modified the isolation formation of *Lim et al* by utilizing an oxidation for the first insulating film and an HD Plasma for the second insulating film for the purpose of forming the top (second) insulating film with higher film quality compared to the bottom (first) insulating film, which can be formed by an easy oxidation process.

c) In re claims 6-7, *Wu* disclose the oxidization process performed at a temperature of 800-1100 °C, but not thickness of the first and second insulating films.

It would have been obvious to one of ordinary skill to have modified the multi-layer isolation of *Wu* by utilizing the claimed layer thickness because one would adjust any one of the deposition parameters (e.g., time, temperature, pressure, depositing rate, etc...) to obtain a desired thickness of the deposited layer.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Lim et al* and *Wu*, as applied to claim 1, in view of *Fukushima* (US 4,866,004).

The combination of *Lim et al* and *Wu* does not suggest a tilt angle of the V-type trench. *Fukushima* suggests by showing that the V-type trench has a tilt angle of about 45 degree.

It would have been obvious to one of ordinary skill to have modified the V-type trench of *Lim et al* and *Wu* by utilizing a suggested trench tilt angle for the purpose of emphasizing the V shape of the trench that has characteristics of a shallow groove, a depth of the groove being automatically controlled, and the forming process being simplified [col. 3]

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 from 7:00 to 17:00 (Monday-Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* can be reached at (571) 272-1907.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.



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Calvin Lee

Patent Examiner